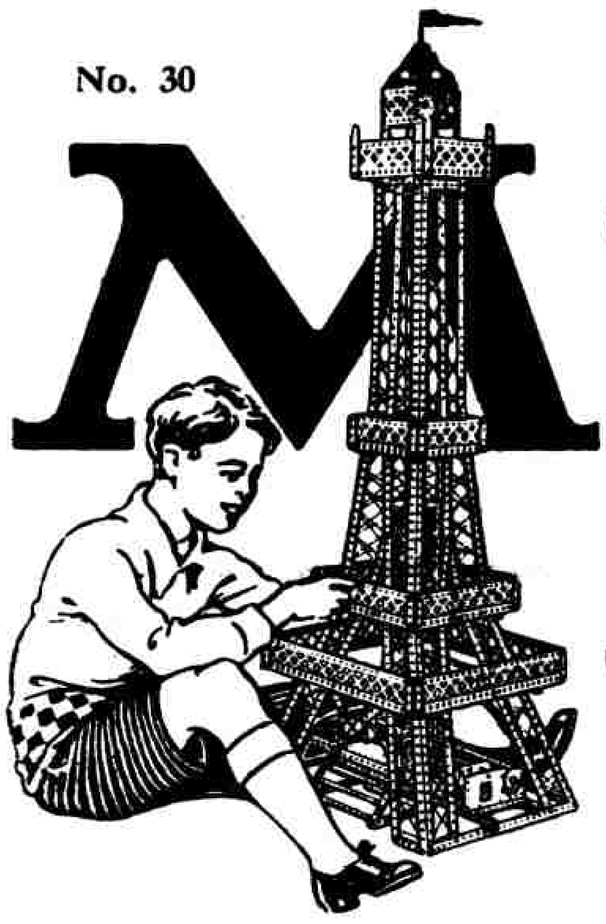
THE NEXT NUMBER OF THE "M.M." WILL BE PUBLISHED ON 15th FEBRUARY

No. 30 JANUARY 1923



MECCANO MAGAZINE

PRICE 1d

PUBLISHED IN THE INTERESTS OF BOYS

Special Articles in this Issue

Two Famous Locomotives
Meccano Helps to Invent Motor Cycle
The Thermionic Valve
The Armstrong Circuit
Message from Dr. J. R. Fleming, F.R.S.
Radio Installation on Trains

BOYS and men may be broadly divided into two classes. One includes those who are content to go through life in a haphazard way, and who do not accomplish anything in particular. The other includes those who possess the power that enables them to achieve results, often the seemingly impossible. We have only to look through the pages of history to find that none of the men belonging to the former class are mentioned. It is the men who overcome difficulties, the men who are unaffected by disappointments, who make history.

Men who Make History.

What ship's captain would set out, even on the shortest voyage, without a compass? He would say, probably very forcibly, that without a compass it is impossible to navigate his ship. Yet there were expert navigators long before the mariners' compass was invented. Over 2,000 years ago the Phœnicians sailed through the Mediterranean, coming to this country to exchange dyes, ivory and spices, for tin from the Cornish mines. These adventurous sailors had no compass to guide them over the strange seas, and yet they accomplished what a first-class mariner to-day would hesitate to attempt.

Steering without Compass.

Pizarro, faced with starvation, mutiny and death, overcame all difficulties in conquering Peru. Searching for riches and fame, he was stranded on a small island with but thirteen followers and without food. Suffering untold hardships, from which the only hope of relief seemed to be to turn back to Panama, the dauntless Spaniard traced a line in the sand with his sword. "Friends and comrades," he said, "on this side, the south, are toil, hunger, storm, desertion and death. On this side, the north, ease and pleasure. There lies Peru with its riches—Panama with its poverty. Each man must make his choice. For my part I go to the south." Saying which, he stepped across the line in the sand; and every one of his men followed him—to success.

Pizarro of Peru.

Alone on the vast expanse of the Atlantic, and surrounded by a gang of mutineers intent on murdering him, Columbus quelled the discontent of his men. Inspiring new confidence in their hearts, he sailed on and on—to discover a New World.

During the American Civil War, General Grant made desperate but forlorn attempts to capture the fort at Vicksburg. He encountered every conceivable obstacle, and for months on end his efforts were without hope of success. At last, however, the fortress surrendered, and Grant, crowned with glory, lives to-day as one of the greatest men in American history.

A Great General.

History is full of examples of how courageous men, hopelessly handicapped and faced by apparently unsurmountable obstacles, were buoyed up by the courage of their convictions so that they turned failure into success; defeat into victory.

The secret of the success of each great man of history is that he did not wander aimlessly through life. He had a plan and made up his mind to follow it, even although at times unforeseen obstacles arose that tempted him to forsake his plan and take an easier course It is the overcoming of all obstacles that is responsible for the joy of everything worth having in the world. It is determination that enables us to overcome even the greatest obstacles, that makes possible the accomplishment of any achievement, no matter how impossible it may seem.

Work with a Plan.

GREETINGS

Mr. Hornby and the Editor wish to thank the numerous readers of the "*M.M.*" who have sent Christmas and New Year cards from all parts of the world. Owing to the large number of greetings that have been received it is impossible to acknowledge them individually, and it is hoped the senders will accept this announcement as an acknowledgment.

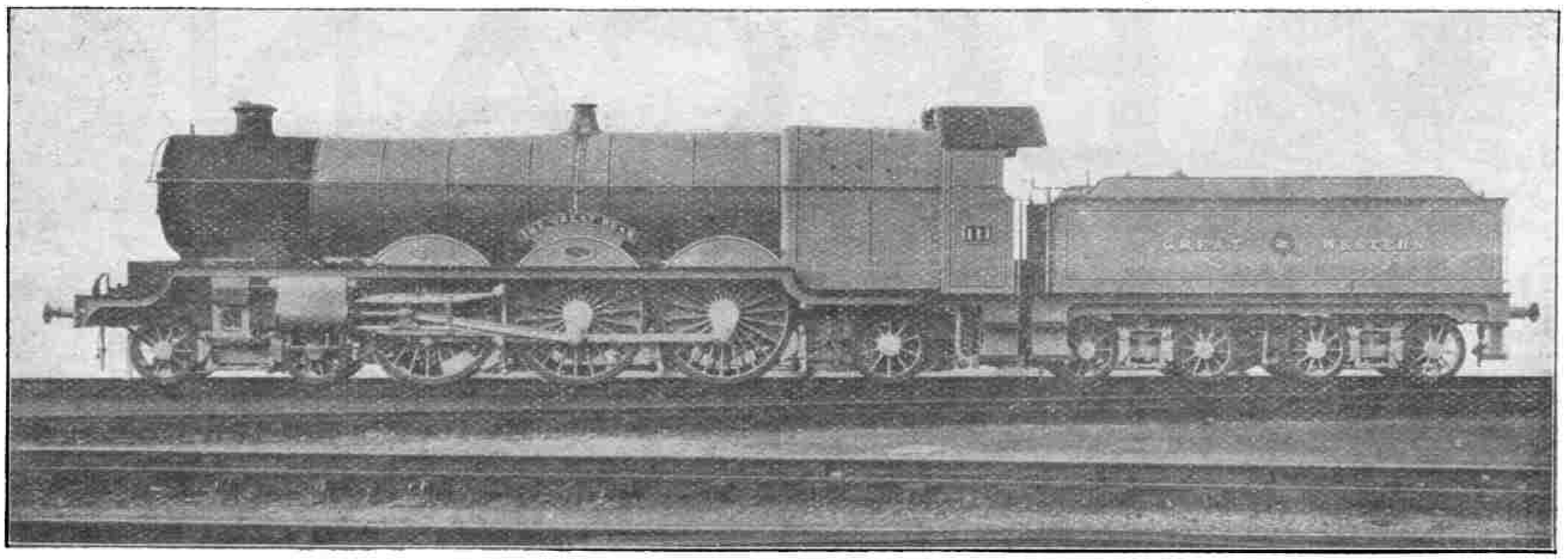
Every good wish for the New Year is sent to all our readers.

Before long you boys will find yourselves in one of these two classes. Which is it to be? Will you be content to stand by, while others achieve the impossible; or will you form your plan in life and make up your mind to follow that plan, so that when you become a man you will belong to that class of men who do great deeds? Weak men dislike anything that savours of opposition and go out of their way to avoid it. Only the determined men find pleasure in overcoming difficulties and take a delight in facing obstacles. Like Pizarro, Columbus, and Grant they achieve the impossible in their business and in their home life, and experience the reward that comes to the victor of a hard fight.

Joys of Conquest.

Super Locomotives and Their History

WHAT THE FUTURE HOLDS FOR US



Photograph by permission of the [*Great Western Railway Co.*

The 'Pacific' Type: *"The Great Bear."*

There is no more interesting subject than the study of the various types of locomotives and of the details of their construction. It makes a train journey a great deal more interesting if we know that our train is being hauled by a locomotive belonging to some famous class. The boy who understands the difference between locos., and the method of their classification, is able to entertain his friends with much information.

AMONG the several famous locomotives in this country there is none more interesting than the "*Great Bear*" and the "*Great Northern*," owned respectively by the Great Western and the Great Northern Railway Companies. Both these locomotives belong to the 'Pacific' type, of which type the "*Great Bear*" was the first example in this country.

In no department of engineering has there been greater advances than in the development of the locomotive. To realise this we have only to compare prints of the famous "*Rocket*" of barely a hundred years ago, with the photographs of locos. of to-day. Locomotive engineers have indeed gone "from strength to strength," and one type leading to another, improvement after improvement has been added. It is sometimes difficult to imagine that locos. of the later types are related to, and have evolved from, some of the earlier types, for the resemblance between the two extremes is often very remote.

In the early days, nearly all express engines were driven by one pair of driving wheels only. Modern locomotives have to pull heavier loads, however, and coupled wheels are generally used to enable the engines to obtain the necessary grip on the rails.

How Locomotives are Classified.

As most readers of the "*M.M.*" know, engines are classified by a numeral system. In this system it is considered that every locomotive has wheels of three kinds:—carrying, driving and trailing wheels. Both the carrying and trailing wheels may consist of either one pair of wheels, or of a four-wheeled bogie. On the other hand, there may be neither the one nor the other. The driving or coupled wheels may be two, four or six in number.

Classification is indicated by numbers, such as 4–6–2. The reference always commences from the front, or chimney end of the engine. The numbers 4–6–2 means that the loco. to which they refer has two pairs of carrying wheels in front (4 wheels) as a leading bogie, three pairs of driving wheels coupled together (6 wheels) and one pair of small trailing wheels under the fire-box (2 wheels)—hence 4–6–2. Engines of the 'Pacific' type belong to this class, four carrying wheels, six coupled driving wheels and two trailing wheels. Engines of the 'Atlantic' type are designated 4–4–2 because they have four carrying wheels, four coupled driving wheels and two trailing wheels.

Should there be no trailing wheels the figure 0 is used and—in the case of the 4–6–2 class—if the trailing wheels were removed the designation would then become 4–6–0. Should the same type of engine have no carrying wheels in front, the designation would be 0–6–2. Engines with three pairs of wheels coupled and no carrying or trailing wheels, such as are used in goods traffic would be designated, 0–6–0.

Continental Classification.

On the Continent a similar classification is used, except that engines are described according to the numbers of their axles, instead of the numbers of their wheels. Thus the numbers are just half those in the British classification, 4–6–2 becoming 2–3–1, and so on.

As we have not sufficient space in this article to describe the many different types of locomotives, we must confine our remarks to two of the more interesting. In the first of these, the 4–4–2, known as the 'Atlantic' type, there is a bogie in front, followed by four wheels coupled and one pair of small trailing wheels below the fire-box. These engines have three cylinders one being inside and two outside the frame.

A Wonderful Invention.

The 'Atlantic' type was first introduced into this country in 1898 in order to obtain a larger boiler. The diameter of boilers had been steadily increasing until in this type it reached the large dimensions of 5ft. 6 ins. In 1908 superheating was introduced and created quite a revolution in boiler capabilities. Superheating is a method by which generated steam is further used as a heating agent, the idea being to use heated steam rather than ordinary steam. Superheating received its greatest testimonial from a test in 1909 when a London, Brighton & South Coast Express Tank loco. ran in competition with the L. & N.W. engine 'Precursor' type "*Titan*" (4–4–0) between Brighton and Rugby. The L.B. & S.C. engine was fitted with Schmidt superheaters. The tank engine (with a water capacity of 2,000 gallons) made the amazing performance of completing the journey of 78 miles without a stop and without taking up water. Not only this but it hauled a train 250 tons at an average speed of 52.6 m.p.h.—an accomplishment unheard of up to that time. The remarkable economy in the consumption of fuel and water in these trials was a deciding factor in favour of superheating.

Adapted by British Railways.

By 1906 most British railways were using 'Atlantics' for the heaviest passenger work, but—with the exception of the North Eastern—most Companies have long since adopted locos. of six wheels coupled designs, while the Great Western have converted all 'Atlantics' to 4–6–0's. For many years 'Atlantics' handled most of the Great Northern Express passenger service. Locos. of this type are used to-day on the North Eastern Railway to work the heavy Scotch trains between York, Newcastle and Edinburgh. The Great Northern Railway also employs 'Atlantics,' but they are of a smaller type than those used by the North Eastern.

The Type of the Future.

The 'Atlantics' have always proved capable of splendid work and have shown themselves to be highly efficient in maintaining running time with heavily laden trains. The noteworthy success of the design is mainly due to the fact that because of the very large boiler-capacity, the engine may be worked very hard with little or no fear of running short of steam.

Two Famous Locomotives (*continued*).

In spite of this useful feature, however, locomotives of this type are not being constructed to any extent to-day, it being eleven years since the last 'Atlantic' was built for the Great Eastern. To a certain extent this is due to the fact that their place is being taken by the 4–6–2 'Pacific' type, on which type it would seem that future designs will be largely based, especially for locomotives of greater power than can be obtained with four wheels coupled.

A Famous Locomotive.

These requirements, together with the proved success of the three-cylinder system, have led to the use of engines of the 'Pacific' type for the Great Northern express service. It is believed that their introduction for hauling trains between London and Edinburgh will not only permit of a considerable increase in loading, but will also obviate the necessity for a second engine on some of the heavier gradients north of Newcastle.

One of the most famous engines of the 'Pacific' type is the "*Great Bear*," belonging to the Great Western Railway. This well-known engine, which has now been in service for ten years, has four cylinders and an immense boiler, and until recently was by far the largest express engine in this country. It generally works trains between London and Bristol, and because of its high power is frequently employed in hauling long and heavy goods trains.

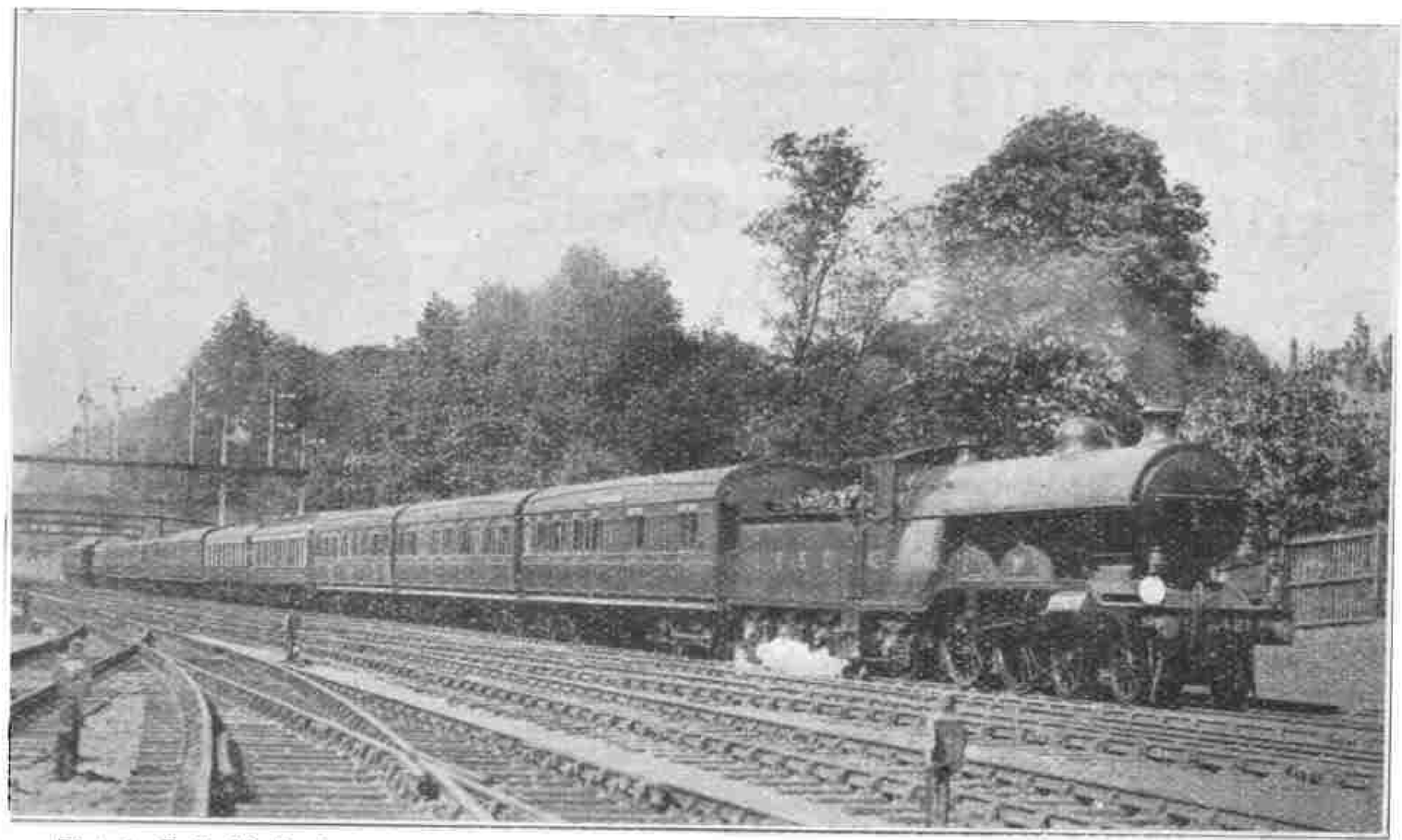


Photo by F. E. Mackay] [*From the "Railway Magazine."*

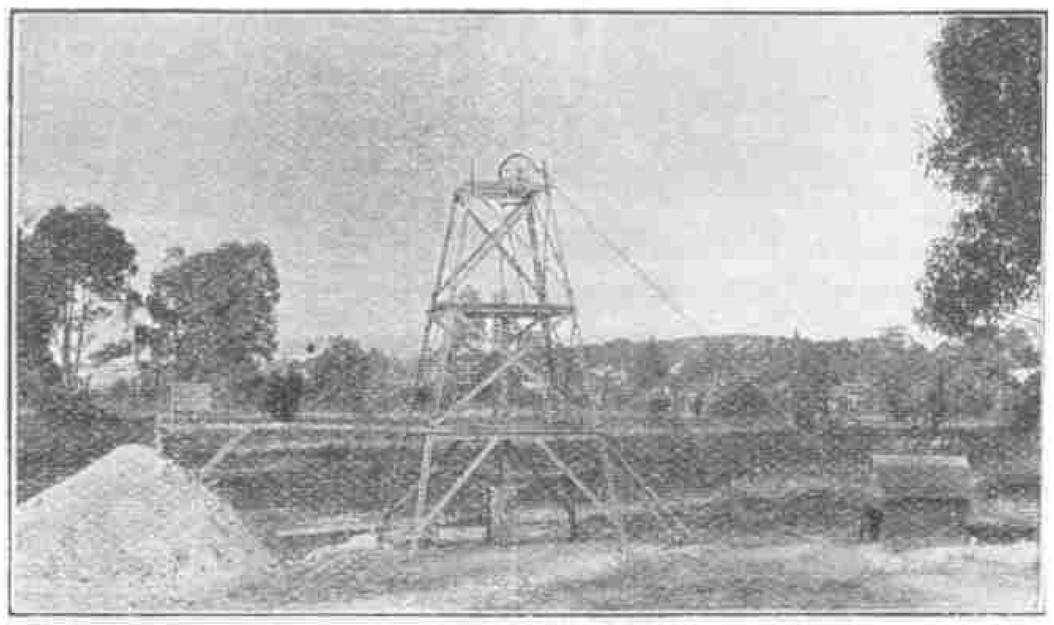
The 'Atlantic' Type.
Locomotive No. 421 (4–4–2).

Our Most Powerful Locomotive.

In point of size and general interest, however, the "*Great Bear*" has recently been eclipsed by the "*Great Northern*," now the largest and most powerful loco. in use in Great Britain for express passenger work. It hauls the "Flying Scotsman" on the long up-hill pull as far as Grantham, leaving King's Cross at 10 a.m. daily.

(*To be concluded.*)

The Mallins Boys of Bendigo.

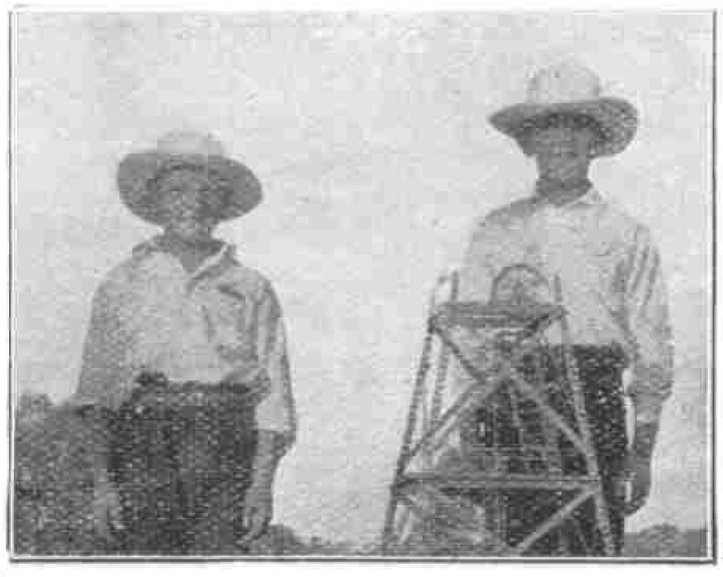


Master Mallins' Model Pithead Gear

We are able to publish a photograph of the two sons of Mr. A. Mallins, Manager of the Bendigo Amalgamated Gold Mines. These two boys are keen Meccano boys and have built many interesting models. Our photograph shows a model of a pit-head gear and we congratulate Masters Mallins on their realistic reproduction of a structure that is of such importance.

It is interesting to note that a Meccano dealer in Bendigo has arranged for the loan of this and other models, and with them is making a very effective display in his window.

We feel sure that our readers will join us in sending our good wishes to these two happy Meccano boys overseas. We shall look for further evidence of their ingenuity in time to come.



The Meccano Smile!

The Meccano Manuals

There are three Manuals, the 0 Manual for simple models built with the 0 Outfit, the 0–3 Manual comprising models built with any of the Outfits from 0–3 and the Complete Manual, which comprises a selection of models that may be built with every Outfit from 0–7. This latter Manual is a very fine publication and should be in the hands of every Meccano boy. It includes instructions for building most of the models shown in the present No. 3 Manual. A limited supply of the No. 3 Manual is still available.

PRICES OF MANUALS:		s.	d.
0 Manual	post free ...	0	6
0–3 ,, ...	,, ...	1	2
Complete Manual ...	,, ...	2	10
No. 3 Manual	,, ...	1	4½

Change of Address.

Subscribers should immediately notify the Editor of any change of address. Send a Postcard *giving the old and new address*, so that records may be kept up to date.

Meccano Helps to Invent Motor-cycle

By Lt.-Col. McKechnie.

In this article Lt.-Col. McKechnie tells how very helpful he found Meccano. The Colonel, who describes himself as being "a Surgeon by profession and a Scientist by inclination," was Commandant of a War Hospital in India at the time he invented his motor-cycle. We feel sure that all readers of the "*M.M.*" will be interested to read of the original Meccano Model of the McKechnie Motor-cycle.

AT the time I invented the motor-cycle that bears my name I was stationed at Karachi, a tropical sea-port town of India. Karachi is surrounded by a

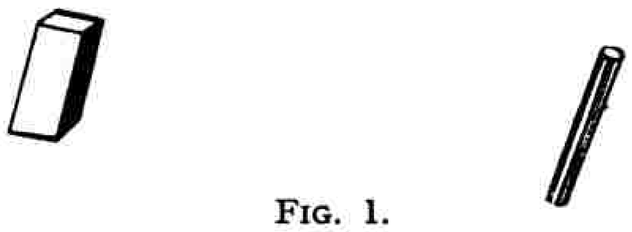


Fig. 1.

desert, across which communication with the interior is effected by a single railway. There is practically no rain-fall and the desert supplies no food for horses, so that although horses are usually used elsewhere in India they are not of much use in Karachi. Here the Europeans nearly all use motor-cars, but there are many who, like myself, cannot afford to do so.

Having neither horse nor car, and finding that a push-bike was an impossible means of locomotion owing to the tropical heat, I purchased a handy little motor-cycle. Although this carried me very well and enabled me to get through my medical work much more quickly, it shook me up a good deal for there is only one good road in Karachi, between Government House and the station. On the other roads the rigid frame and 24" wheels caused a great deal of vibration that jarred me from head to

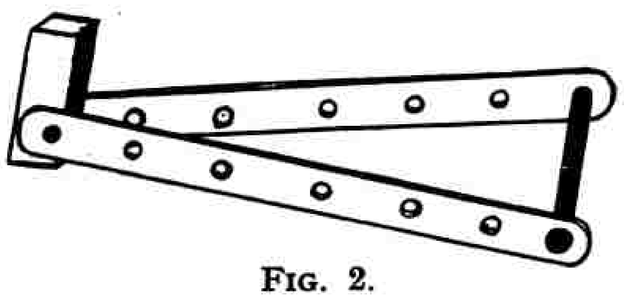


Fig. 2.

foot, for though my machine was fitted with spring saddle and spring forks these were quite inefficient on such rough roads as are encountered in India. This discomfort made me determine to invent a spring-frame motor-cycle.

As most of my readers know, nearly all motor cycles have rigid diamond frames, for they have been evolved from the push bicycle. The first motor cycle was merely a push cycle with a petrol engine clamped to the frame, and from this beginning the present-day motor cycle has been evolved.

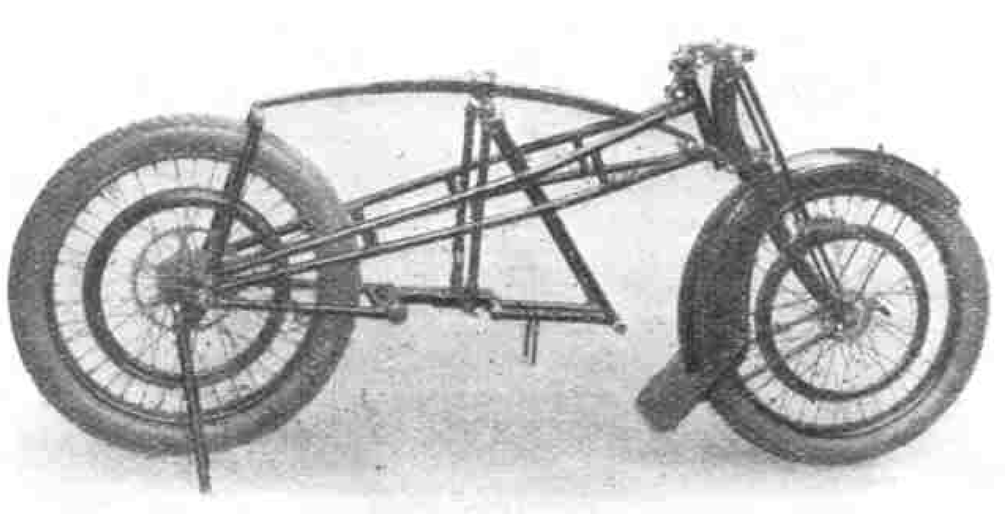
Having made a number of sketches and drawings I sought for a means of testing my ideas. Knowing that Indian workmen are unintelligent and moreover are aggravatingly slow, I realised that there was likely to be an interminable delay if I decided to have them make me a model. Suddenly I remembered that the young son of one of my medical officers had a Meccano Outfit, and an interview with his father resulted in my being able to borrow the Outfit. The Outfit was a No. 6 and I found the Meccano parts quite satisfactory for building a model of my suggested motor cycle, except that there were no suitable wheels. I soon supplied this deficiency, however, by using two wooden bungs from large stone jars in which we stored medicine.

It took me about an hour to construct the model, but only thirty seconds were necessary to show that it could not possibly work! Although I had obtained excellent springing, I had failed to anchor the back wheel axle to the steering head. As soon as a weight was placed on the saddle, the wheels flew apart! A few minutes' study of the model showed what was wrong and the difficulty was soon overcome and another model built. To all intents and purposes this model was identical with the McKechnie motor cycle shown for the first time at Olympia in November of last year.

The McKechnie Motor-cycle in its final form fitted with a 5/7 H.P. Coventry-Victor engine.

Briefly the model consisted of a rigid frame formed of two tension members joining the steering head and the back axle (Fig. 1) and giving a triangulated girder (Fig. 2). Two compression members were added to maintain the correct slope of the steering head (Fig. 3) the whole forming a rigid triangulated frame, which carried no weight but served simply to fix the back axle immovably with respect to the steering head.

The weight-carrying frame was next constructed with a Meccano strip (representing a leaf spring) running horizontally from the bottom of the steering head to a bridge-piece, over the back axle (Fig. 4). The engine was supported by a special cradle, the construction of which allowed independent freedom of movement so that both back and front wheels could follow the irregularities of the road. The cradle was supported at the rear by the back axle and suspended at the front from the centre of the leaf spring (Fig. 4). Other important details in regard to rigidity, etc., were subsequently carefully worked out and embodied in the finished model.



Details of the spring frame construction of the McKechnie Motor-cycle.

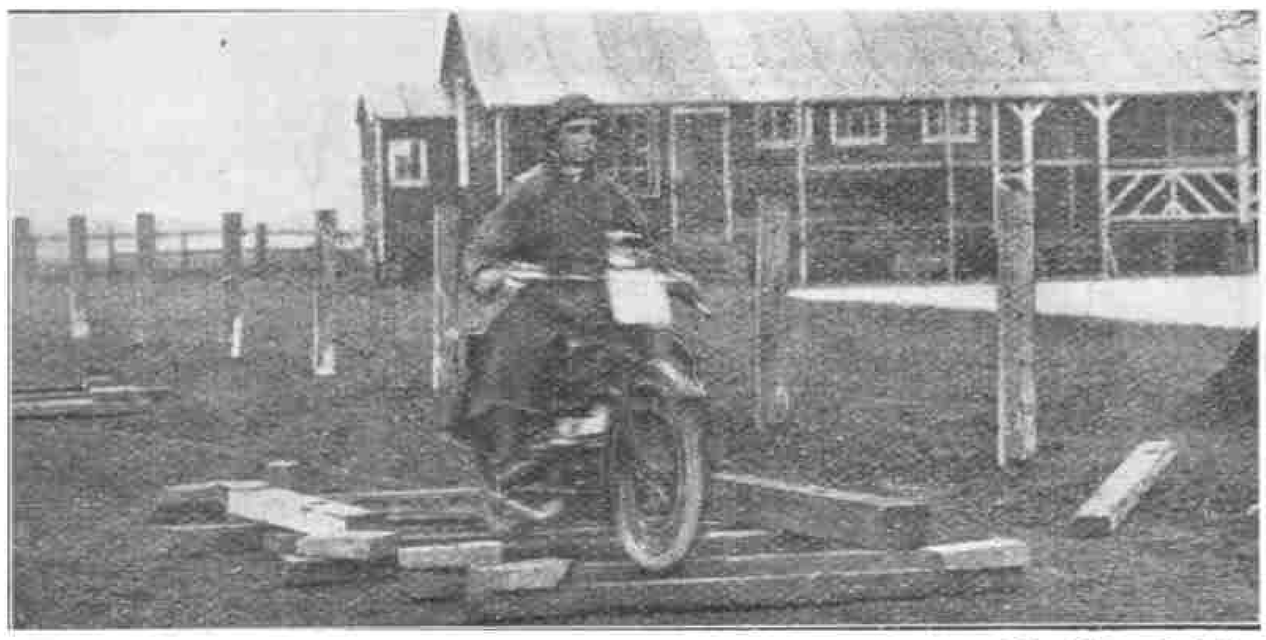


Photo by courtesy of ["*The Motor Cycle.*"

Trial over sleepers to demonstrate the perfect springing of the McKechnie Motor-cycle.

With the Meccano model before me, it did not require a great deal of imagination to visualise in my mind's eye what the actual motor cycle would be like. I worked on my Meccano model and experimented with it until I learned exactly how the spring should be placed to give the easiest riding positions; the nature and location of the strains the frame would have to undergo, and whether they were strains of tension, compression or twisting.

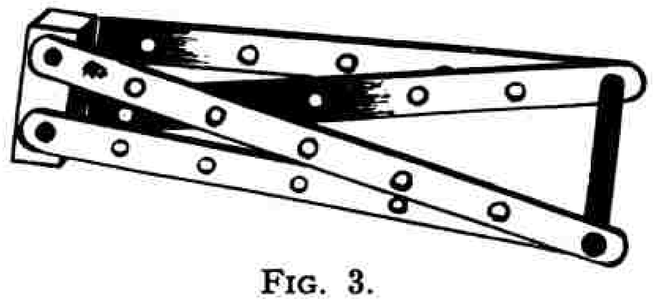


Fig. 3.

Although I had first worked it out in my head and then on paper, it was the Meccano model that filled me with joy and confidence. It seemed so substantial when braced up, so springy and business-like that I could almost imagine it saying:—"Here I am, sprung like a car—even my engine—with a springing that is better than you will find in many cars. There is nothing tinny about me. I have no shackles or tiny joints that

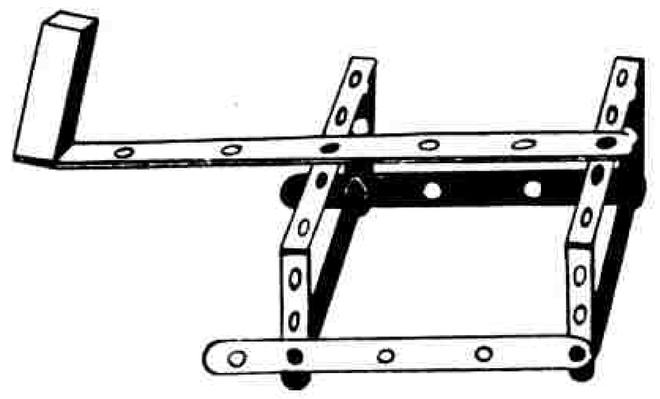


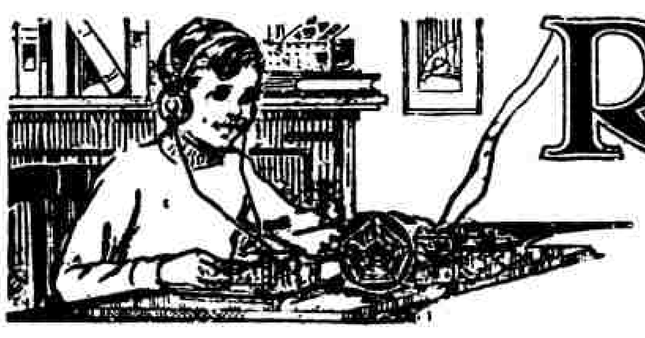
Fig. 4.

will wear themselves to pieces. My frame does not whip and the metal is disposed where it is most wanted. I am truly rigid where I should be rigid, and truly flexible where flexibility is needed."

My Meccano model seemed to say all this, and a good deal more, as I handled it and pressed on its spring or cradle. From it I knew that my idea was sound, and I felt convinced that I could face and overcome the many obstacles that lay between the conversion of the Meccano model into the finished product of the McKechnie Motor Cycle.

The little boy who had lent me his Meccano Outfit became very restive at my prolonged use of it. More than once his father came to me and said he wanted it back, and several times I put him off because I had not finished my experiments. At last, however, the first model of the McKechnie Motor Cycle was resolved into its component parts and the Outfit returned with grateful thanks to its owner.

Now that my vision is realised and the McKechnie Motor Cycle an accomplished fact, I have had the added pleasure of sweeping along the road on it and discovering in it a new vehicle of locomotion that combines the glorious sensations of sitting on an easy-actioned thoroughbred horse and speeding in a fast car.



RADIO SECTION

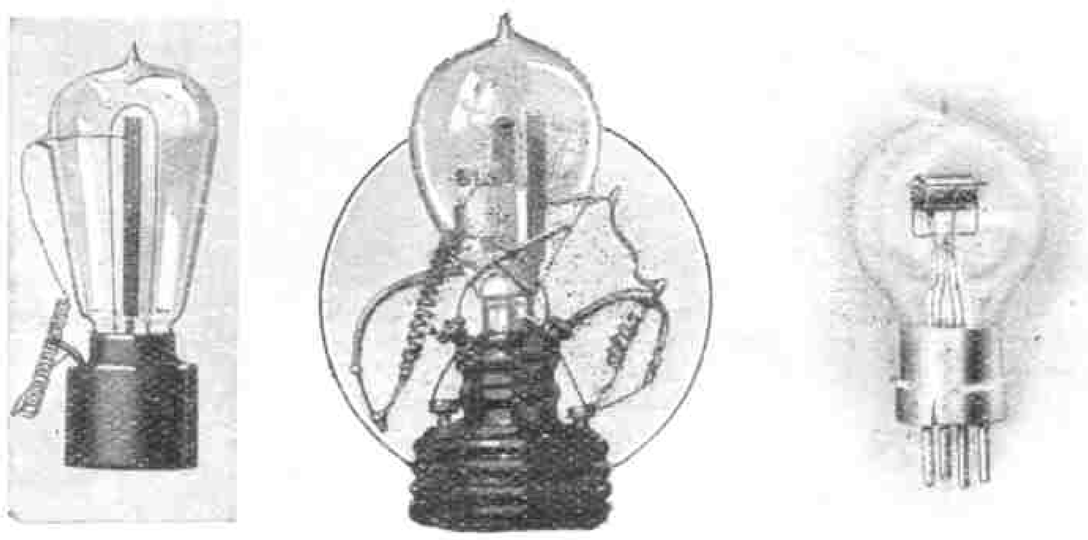
The Thermionic Valve

THE INVENTION THAT MADE WIRELESS TELEPHONY POSSIBLE.

The following is the final instalment of the special article explaining the principle of the Thermionic Valve. In it is described Dr. Lee de Forest's addition to the Fleming Valve.

(*Concluded.*)

The story of the further development of the valve commences in 1907, when Dr. Lee de Forest, an American scientist, conceived the idea of introtroducing into the bulb a third element in the form of a perforated metal plate or "grid." He supported this grid by a separate connecting wire, fused through the glass of the bulb and inserted between the plate and the filament (see Fig. 7). Thus, negative electrons from the filament had first to pass through the meshes of the grid before reaching the plate that attracted them.



Photographs by courtesy of "Popular Science Monthly" and the G.E.C., Ltd.

Three Stages in the Development of the Thermionic Valve.

On the left is illustrated a globe with plate inserted to give the "Edison Effect." In the centre, the valve as used by Professor Fleming in his experiments. On the right, a modern Thermionic Valve as used for Radio reception.

The Function of the Grid.

It is not difficult to understand that if this interposed grid is negatively-charged it will tend to drive back the negative electrons to the filament, in spite of the attraction of the positively-charged plate. On the other hand, if the grid be given a positive charge it will assist matters by attracting the electrons through its meshes to the plate. The stronger the positive current in the grid, the greater will be the number of electrons attracted.

The apparatus may, in fact, be compared with a machine-gun (the filament) which is bombarding a target (the plate) with bullets (the electrons). These bullets must pass through the grid before they reach the target, the oscillations from the aerial causing the grid to act as a spasmodic shield. When the positive half of the aerial current reaches the grid the negative electrons are allowed free access to pass to the target (see Fig. 5 *) When the negative half of the impulse reaches the grid, the effect is as though a screen were lowered between the filament and the plate, thus completely cutting off the stream by negative electrons (Fig. 6 *).

By suitably regulating the relative currents in filament and plate circuits, one-half of the incoming current can be made to influence the plate circuit to a greater extent than the remaining half; indeed, the latter half can be made to have practically no effect at all.

Every time the grid allows the electrons to pass from the filament to the plate an impulse is produced in the plate circuit; this is converted into sound waves by a telephone earpiece, included in the circuit. Thus, because the passage of these impulses has been controlled through the grid by the wireless waves, the sounds in the 'phones are similar to those at the transmitting station.

To this improved form of Valve, Dr. de Forest gave the name Audion. Because it also possesses the property of magnifying the current, it is called the Amplifying Valve. In America it is known as the Vacuum Tube.

There are several types of valves in use to-day. In the type generally employed the plate is made in the form of a metal cylinder, which is fitted around the filament. As we have already seen, this form of plate attracts the greatest possible number of electrons from all sides, and the efficiency of the value is thereby greatly increased. The grid generally takes the form of a spiral of fine wire fitted between, but insulated from, the plate-cylinder and the filament.

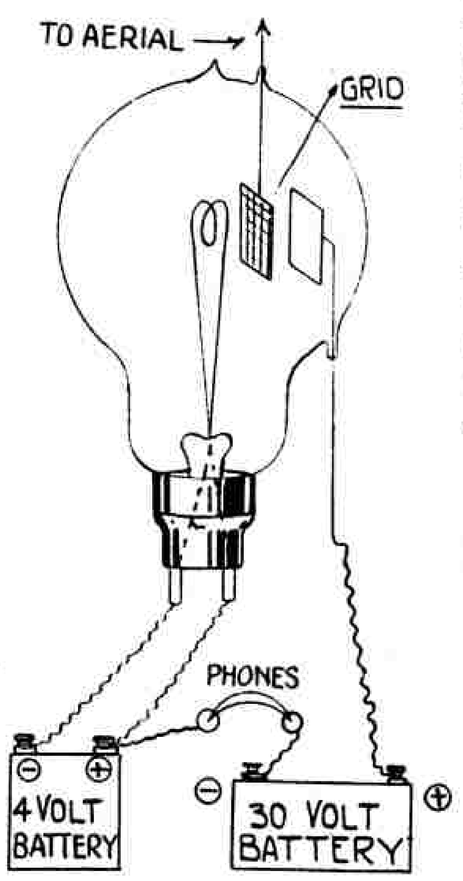


FIG. 7.

The Valve and Radio Receiving.

We must now learn how the valve is used for the reception of wireless messages.

We have seen that if the grid is negatively charged it will repel the filament electrons, and that the degree of its repulsion depends on the strength of the grid's negative charge. It has also been mentioned that the oscillations received by the aerial from the transmitting station are composed of alternating currents—half positive and half negative.

The grid is connected to the aerial, and when the oscillations reach the grid they affect the degree of strength of the negative charge it carries. Thus, when the negative half of the incoming oscillation reaches the grid, it increases the negative charge of the grid and so causes the latter to repel, to a certain extent, the electrons from the filament. When the positive half of the aerial current reaches the grid, the flow of electrons to the plate is assisted. In this way, the incoming oscillations alternately weaken and strengthen the flow of filament electrons to the plate.

Several Valves give Greater Amplification.

A very important feature is the fact that one or more valves may be connected and used together. By doing this, the stream of electrons (or the "current" as it should now be called) received on the plate of the first valve may be conducted to the grid of a second valve, where it is subjected to a further amplifying action and passed on to a third valve. The amplification need not end there and, theoretically, it may be continued almost without limit. With every additional valve a greater magnification of the original current is obtained, and the minute oscillations received by the aerial may in this way be converted into sound waves of such great volume that—if a concert is being received—the music may be made to fill a room, or even a hall for dancing.

The addition of every valve, however, naturally adds to the complication of the apparatus. It also adds considerably to the expense, as batteries are required to supply the valves with two separate currents—a low and a high-tension. The maintenance of these batteries is an expensive item. In practice three or four valves generally give all the results required, but sometimes six or even eight are used.

De Forest's valve fulfils yet another highly-important function, discovered in 1913. If connected to an appliance called a transformer, the valve will generate electric oscillations and continue to do so

* Figs. 5 and 6 will be found in the last issue (December) of the "*MM*."

The Thermionic Valve (*continued*).

as long as the conditions remain the same. By means of an aerial these oscillations may be broadcasted, and the valve thus becomes a powerful transmitting apparatus. The oscillations may be "tuned" to any frequency required—even up to millions per second. The effect thus obtained is due to the reaction of the plate and the grid circuits on each other and is similar to the well-known action of the singing arc.

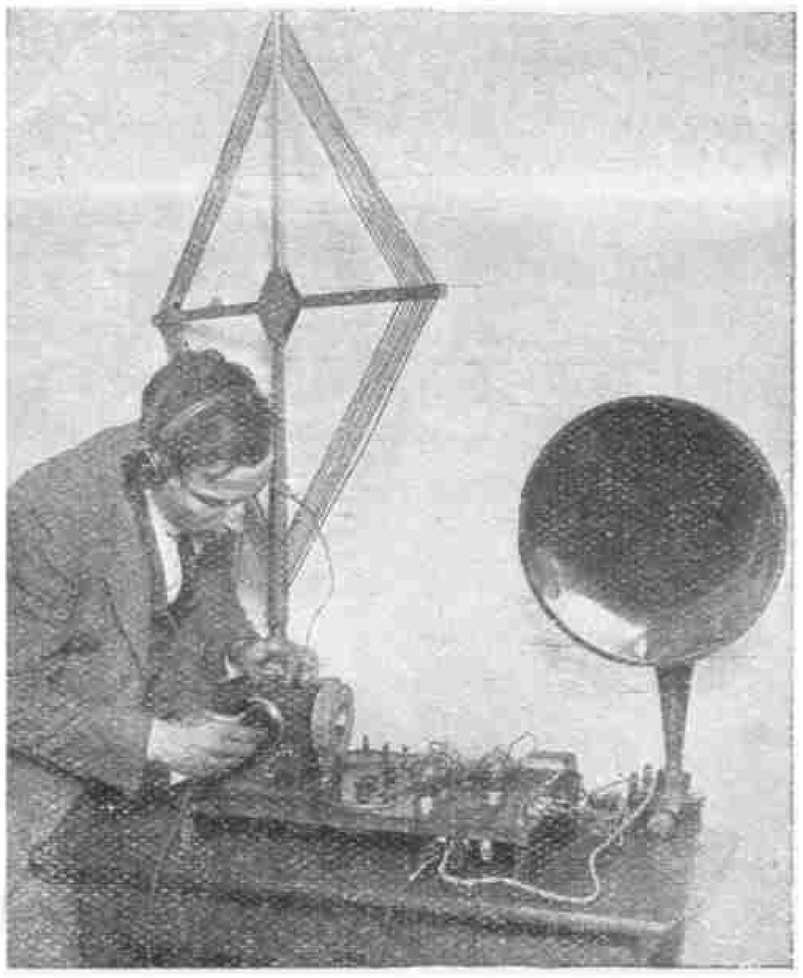
It has been found that under certain conditions a valve used for receiving may generate these oscillations and thus act in every way as a miniature transmitter. If this oscillation occurs it is liable to cause serious interference to other stations listening-in. For this reason the Postmaster-General objects to the installation of valve sets that use reaction. Especially is this the case if the set is being installed by an amateur who has not sufficient scientific knowledge of the subject for him to understand how this interference is caused, and what it means. By using certain connections, however, the reaction principle may be used in such a way that no interference can possibly be caused to other receiving stations. Valve receiving apparatus of this type has recently been approved by the Postmaster-General.

THE END.

The Armstrong Circuit

A Wonderful Invention that gives Great Amplification

No more wonderful discovery has been made in recent years in Radio than the circuit brought out by Major Armstrong, an American scientist. This discovery is called the "the Super-regenerative circuit," and consists of making the connections between batteries and valves in a particularly effective manner, by which the incoming impulses are greatly magnified.



Photograph] ["*Popular Radio.*"

Our illustration shows Major Armstrong adjusting the controls on his super-regenerative receiving set.

The possibilities of the Armstrong circuit are astounding. As an example it may be mentioned that with only three valves the same result is obtained as requires nine valves in apparatus using ordinary connections.

Major Armstrong recently demonstrated his invention before the American Institute of Radio Engineers in New York, when wonderful results were obtained even with a limited aerial. In the course of this demonstration, Major Armstrong filled a large auditorium with music, received by radio, from the broadcasting station WJZ 15 miles away at Newark, New Jersey. On this occasion he used only a small loop-frame aerial as shown in the accompanying illustration.

Needless to say, the connections used by Major Armstrong are suitable only for valve receivers and are very complicated. The amateur who uses this circuit must therefore be fully conversant with the theory and practice of Radio.

The broadcasting station at Newcastle-on-Tyne is now working, and Sir William Noble, the Chairman of the Broadcasting Committee, recently stated that the stations at Cardiff and Glasgow are to commence working at an early date.

* * *

Newcastle broadcasts concert and news items from 6.30 to 8 each evening. The wave length is 400 metres and the power 1,500 watts. The call signal is 5 N O.

* * *

Manchester Broadcasting Station transmits nightly. The wave length is 385 metres and the power approximately 1,500 watts. Call signal, 2 Z Y.

* * *

Broadcast may be heard from Marconi House every evening. The wave length is 369 metres and the call letters 2 L O. The power used is 1,500 watts.

News is broadcasted at 5 p.m., with concerts and late news until 10.30 p.m.

* * *

Birmingham Broadcasting Station at Witton broadcasts every evening with a power of about 1,500 watts and wave length 425 metres. The call signal 2 W P. The programme begins at 6.30 p.m. with children's stories.

Broadcast is sent out from the Eiffel Tower, Paris, from 6.20 to 6.50 p.m., when a concert (in French) is transmitted. The wave length is 2,600 metres, the power 4,000 watts and the call signal F L.

* * *

Writtle, near Chelmsford, transmits from 8 p.m. to 8.30 p.m. on Tuesdays. Wave length 440, power 250 watts. Call, 2 M T.

The Hague broadcasts Sunday concerts from 3 to 5 p.m. on a wave length of 1,085 metres.

* * *

Amateurs in London and district may hear during almost any evening several amateur stations sending out telephony on wave lengths between 200–300 metres.

Slot-Machine for Radio.

CONCERTS "WHILE YOU WAIT."

The wonderful development and popular interest in wireless is further demonstrated by the inventor of a 25c. Radio Slot-Machine. The possibilities for such a machine in this country are, as yet, obscure, but there can be no doubt that the time will come when Radio slot-machines may become available for public use. Railway stations will have rooms set apart for this purpose, and the dull monotony of "waiting for the next train" will no longer exist. This is only one of many useful functions that public Radio sets could easily fulfil, but until wireless broadcasting becomes more general, such inventions cannot be commercially possible.

The new Radio slot machine is an American invention and consists of an automatic apparatus with an exterior not unlike a Post Office stamp slot-machine. In order to hear whatever programme is being broadcasted at the time, a coin is inserted in the slot and the current to the valves being automatically switched on, a large horn at the bottom of the instrument delivers a programme of music or speech, as the case may be.

Terrestrial "Interference."

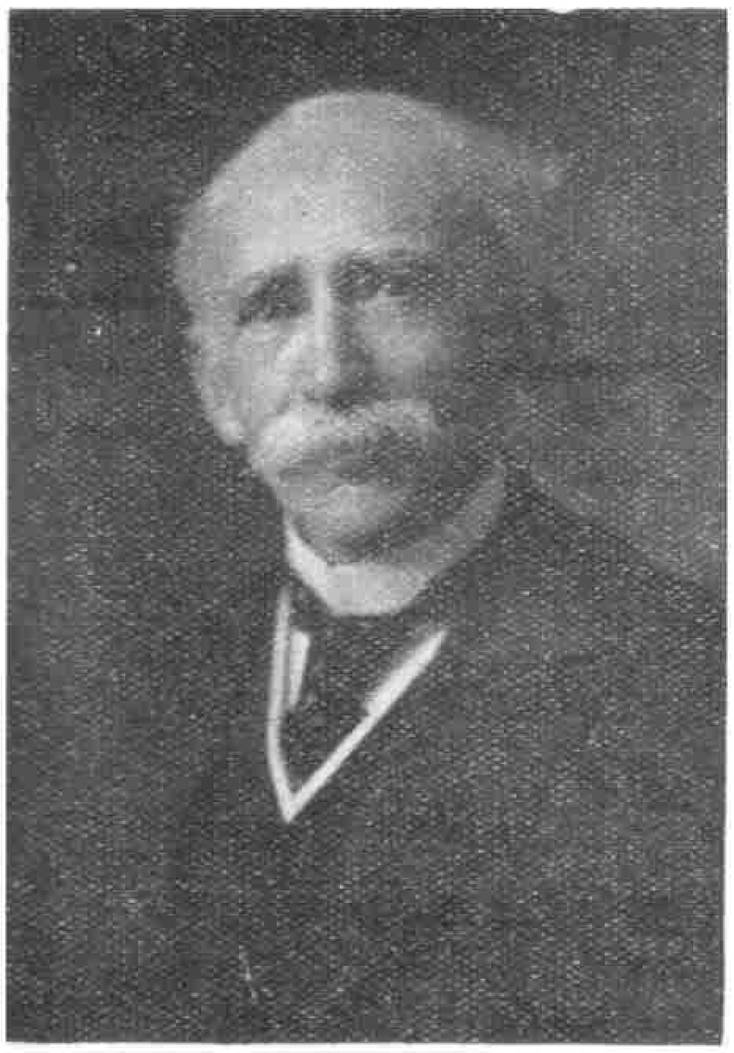
THE RADIO ENTHUSIAST: "I wonder whether that shriek is in my condenser or in my valves!"

(*Peculiar noises are often heard in the telephones of a receiving set. Sometimes these noises have an electrical origin—at other times they have not!*)

A Message to Meccano Boys

FROM

Dr. J. A. Fleming, F.R.S.



DR. JOHN AMBROSE FLEMING, F.R.S.

Professor of Electrical Engineering in the University of London and Inventor of the original Thermionic Valve, which in its subsequent developments is the instrument that has made Wireless Telephony possible on a large scale.

"I am glad to hear that so many Meccano boys are interested in Wireless Telegraphy and Telephony. It is not only a subject of immense scientific interest, but there is an abundant field for new inventions. In this connection it may be mentioned that many of the valuable discoveries in Wireless Telegraphy have come from amateurs. Moreover, a study of this subject necessitates a knowledge of the sciences of Electricity and Magnetism and an intelligent boy can learn more from experiments he carries out himself than from more elaborate performances in the class room or laboratory.

At the lectures I gave last Christmas at the Royal Institution in London I had a very large audience of young people who were greatly attracted by the discourses given on 'Electrons, Electric Waves and Wireless Telephony'."

Yours faithfully

J. A. Fleming

H. A. Longley (Surrey).—I hope to publish shortly a series of articles on the theory of Wireless from the beginning to the more advanced stages, so that my readers may thoroughly understand the principles of Radio.

T. A. Gatley (Peel Green, near Manchester).—You should be able to listen-in with a Crystal Receiving Set as you live within the 25 miles radius of the Manchester Broadcasting Station. Mr. Hornby is not thinking of paying another visit to America and Canada at present. He has received many applications from Meccano boys who would like to accompany him.

J. E. Govan (Melrose).—Batteries and accumulators are not required with the Meccano Crystal Receiving Set. Apart from the aerial, and ground or earth wire, the Set is complete. These latter are sold separately.

A. Ramsay Rae (Chester-le-Street).—The price of an aerial set complete and ready for connecting to receiver is 12/6. Write again if you are in any difficulty, for I shall be glad to help you.

J. Taylor (West Hartlepool).—Your cage-type aerial should answer very well, but you will not be able to obtain the best results unless particular care is paid to the insulation of the antenna or individual wires forming the cage. Try to keep within the limit of 100 feet of wire, including the leading-in wire, when fitting your aerial. I am glad that you have written to me on this matter, as it is one that will prove of considerable interest to the other readers.

W. H. Evans (Nottingham).—It is necessary to have a licence in order to receive Broadcast. The cost is 10/- and full particulars may be obtained from any Post Office.

E. West (Rochester).—It is quite possible to add an amplifying valve to a crystal receiver, but this does not increase the range of reception.

L. Clayton (Northampton).—It is not necessary to use a battery with the Meccano Receiver but it is essential to have an aerial. On page 7 of our Radio Booklet is a good illustration of an aerial. You will be well advised to have your aerial as long and as high as possible.

H. Sims (West Bromwich).—The Meccano Receiver will receive on wave lengths of from zero up to approximately 1,000 metres. It is supplied with a single head-phone.

R. Fallows (Londonderry).—No receiving set can be used without an aerial. In your case it would not be practicable to use the electric light wiring in your house as an aerial; as this method requires a Valve Set.

D. J. S. Moyse (Ipswich).—Wave length could be increased by the addition of extra wire if it was considered necessary but as ships work on a wave length of 300 or 600 metres, and as the Broadcasting wave length is between 300 and 400 metres, it is not considered necessary to increase the wave length beyond the present range.

L. G. Blake (Lewisham, S.E.13).—You would not be able to hear Broadcast in any part of the room, as a Crystal Set does not sufficiently magnify the sound to make this possible. It would be possible for you to employ more than one 'phone and so enable two persons to listen-in.

W. Gorton (Stalybridge).—We are afraid that your proposed loud speaker would not be satisfactory, as there is not a sufficient volume of sound from a Crystal detector to make the signals audible.

W. J. Turner (Burslem).—We would point out that the induction coil shown in the Meccano Electrical Manual is not intended to be used as a sparking coil but is essentially a "shocking" coil. To make an efficient spark coil that would give an ½" spark wind about a soft iron core 3¼" long and ¾" in diameter, a primary winding in three layers of No. 20 double cotton covered copper wire. For your secondary winding take a ¼ lb. of No. 38 double silk covered copper wire. It will be necessary for you to use also a condenser, made of 21 pieces of tin foil 2" × 2½", using dialectric of mica,

Singing to Unseen Thousands

Photograph by] [*Western Electric Co.*

Broadcasting is now in full swing in this country. Our illustration shows two vocalists broadcasting a duet at a New York Broadcast Station. The sensitive microphone, which transmits their voices to thousands of listeners-in, is seen on the table near the window. The walls of the Studio are padded with felt and every effort is made to exclude outside noise and inside echoes, for even the minutest sound is picked up by the microphone and sent out broadcast.

Passengers Listen In

Concerts Heard and Criminals Tracked Down, whilst travelling on trains

An American Railway Company recently claimed to be the first railway to instal a wireless apparatus on a train. This is no new invention, however, for over forty years ago scientists were endeavouring to find some means of enabling signalmen to hold direct communication with the guards or drivers of trains.

Before the days of wireless, many suggestions were made for communicating with trains and numerous experiments were carried out on the principle of ordinary telegraphy. An advance upon this method, suggested in 1881 by a Mr. A. C. Brown, was the use of inductance. This scientist proposed to transmit impulses from a wire, laid parallel to the rails, to a coil of wire wound round the engine or guard's van. This latter coil was to be placed in such a position that it should be parallel to, and as near the line wire as possible.

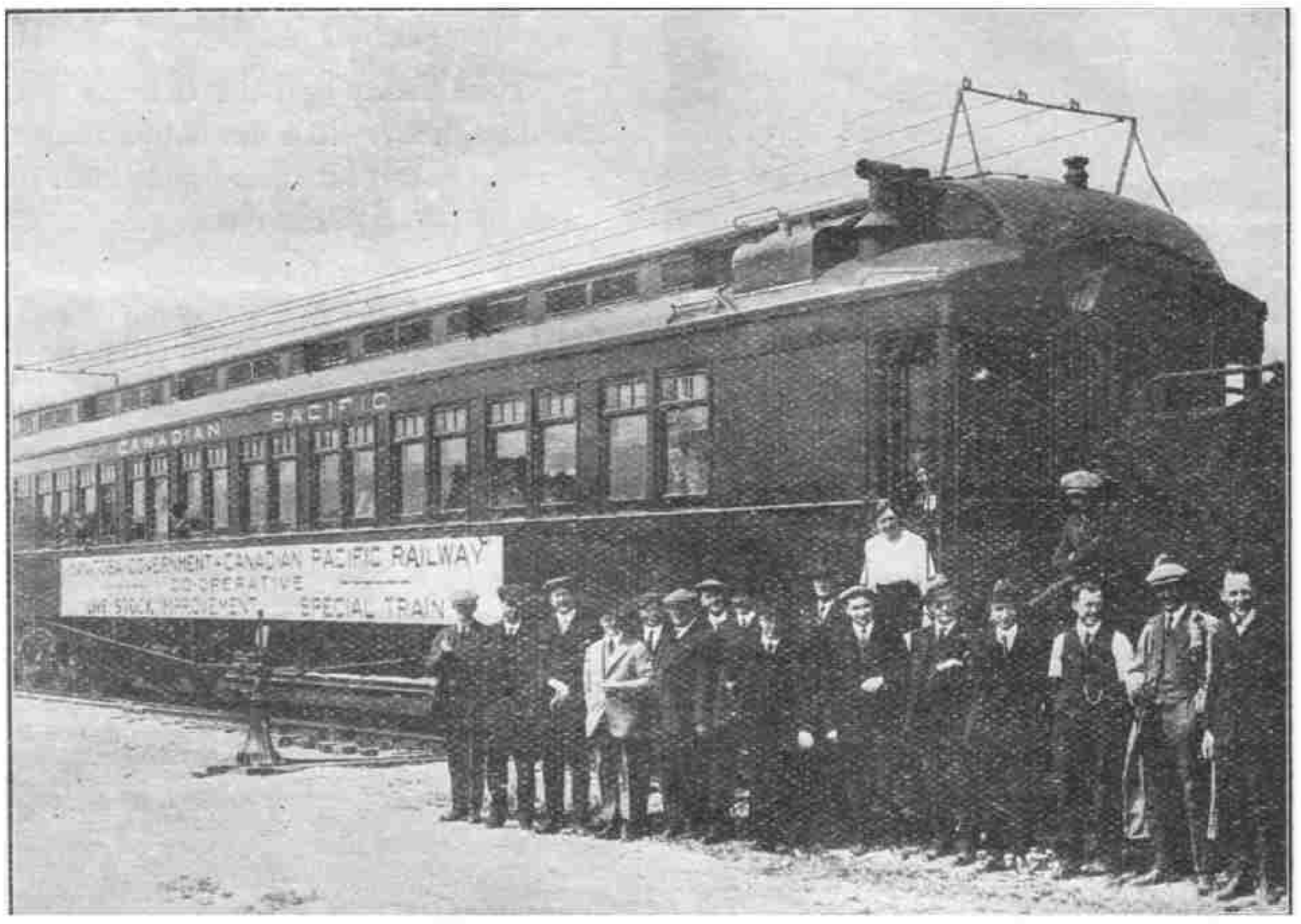
Radio Signals 37 Years Ago.

As long ago as 1885 Edison took out a patent for "an apparatus for telegraphing between moving trains by induction and without the use of connecting wires." In his system Edison used the ordinary telegraph wires running alongside the railway in place of a specially laid wire. He also provided a transmitting apparatus on the train so that passengers could send messages as well as receive them.

Edison's system was used in 1887 on the Lehigh Valley Railroad, and worked perfectly. It had been anticipated that passengers would take advantage of the installation, and keep the telegraph busily employed in flashing messages during their journey. Such was not the case, however, and from a commercial standpoint the scheme was a failure and was subsequently abandoned.

Edison's System of Radio.

A few years later Edison took out a fresh patent for his system, but operating on a larger scale to enable it to be used for communication between vessels at sea, or between ships at sea and stations on land. This was one of the first systems of wireless telegraphy and was a forerunner of Marconi's system, with which such extraordinary good results have been obtained.



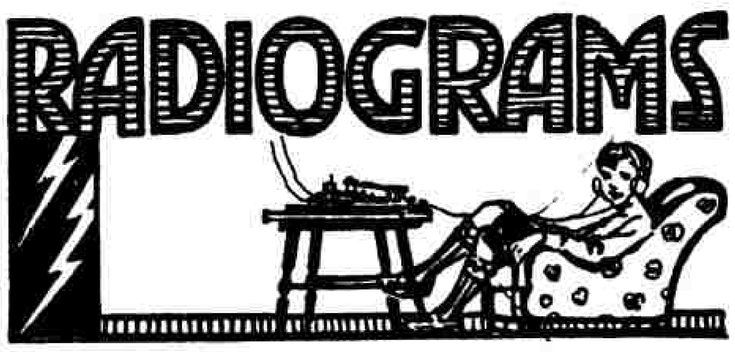
Photograph by] [*C. P. R. Co.*

Radio Fitted to a C. P. R. Train.

Modern Radio and Trains.

With the increased interest in Radio, the subject of communication with trains has again been revived. A Radio apparatus has recently been installed on one of the trains of the Canadian Pacific Railway, enabling concerts to be heard by those on board the train.

Although this particular installation is more or less an experiment, the fact that Radio can be successfully employed in this direction opens out vast possibilities for the future. The imaginations of all Meccano boys will enable them to realise the great possibilities of such installations, when they become fully developed, not only in connection with the arrest of criminals escaping on the train, but in the more commonplace manner of passing the time of a long journey with selections of music, by lectures, speeches and many other forms of entertainment.



It is now possible to make connection between the wireless phone and an exchange on the ordinary land line. Conversation with Amsterdam was recently held from London by means of a land-line to Southwold, wireless over the North Sea, and then by land again to Amsterdam. The conversation was as clearly heard as if an ordinary land telephone line were being used.

* * *

Scientists have for a long time been endeavouring to discover a means of making Radio messages private. In this connection the most effective system yet devised has recently been demonstrated by Marconi, by which the direction of Radio messages can be controlled. By this apparatus direct messages are sent to any desired receiving station and these messages cannot be picked up by stations situated in other directions.

* * *

A world radio combine, with a total capital of thirty-four million sterling, has been formed with New York as a centre. It will include the British Station at Carnarvon, the French Station at Sainte Assise, and the German Station at Nauen.

* * *

As a result of this combine, a working arrangement has been made between the four principal wireless companies, by which foreign telegraphic service to all parts of the world will be conducted from the new Monte Grande Station at Buenos Aires. This new station will be completed within the next few months.

* * *

Another new wireless station is to be erected in Canada at an approximate cost of £250,000. In connection with this scheme Commander C. P. Edwards, the wireless expert to the Canadian Government, is now in this country.

At the new trans-radio central station, Berlin, there is a wonderful "world's time clock." On the face of this clock, which is lit up from inside, there is a map of the world. The hour hands point to various towns situated in different parts of the globe, and it is possible to see at a glance the exact time at any of these towns. A shadow moves over the face of the clock to represent night falling on earth. Although this clock appears to work in a simple manner, it required a very ingenious brain to design and construct it.

* * *

A contract for a new wireless station in Sweden has been placed by the Swedish Government with the Radio Corporation of America. The station will engage in trans-Atlantic service and the entire plant will cost nearly £500,000.

* * *

The new station will be situated near Gothenburg, on the west coast of Sweden, and the equipment will include two 200-kilowatt Alexanderson alternators.

THE MECCANO GUILD

The Secretary's Notes.

I trust that all Guild members will accept my good wishes for 1923, which I hope will bring them happiness and success.

The New Year.

Also, I should like to express my appreciation of the numerous Christmas and New Year greetings received from Guild members at home and abroad.

The First Winter Session has proved eminently successful and arrangements are now being made for the Second Session.

The Second Winter Session.

From letters that I have received I feel quite sure that the success of this Session will be unprecedented. Programmes are being drawn up by Leaders who know just how to cater for the requirements of their members, and it is not surprising to note the increased enthusiasm of the members.

Every day dozens of boys write to me for information, not only about the Guild but about various other subjects. It is

My Mail Bag.

scarcely necessary to mention that I welcome these letters and that it is a pleasure for me to give all the help and encouragement possible. Quite a number of my correspondents apologise for writing on subjects other than Guild matters. I want every member to know that I am here to assist them in any way, and that in any difficulty or doubt, my advice and help are at their disposal.

I expect you have all noticed that in every issue of the "*M.M.*" I publish lists of Clubs recently affiliated with the Guild.

Support New Clubs.

In each case the name and address of the Leader or Secretary is given. I hope that all Meccano boys will make it a point to support any new Club opened in their districts, and to join at the earliest opportunity. They should either write or, preferably, call to see the Leader or Secretary of the new Club, and I am sure they will be made welcome and given all information they desire.

Where a Club is established in connection with a School, it is not always possible to enrol boys who do not attend that particular school. On one or two occasions, however, the Club Leader has been able to arrange matters and if there is any case in point where difficulty arises, I shall be pleased to do what I can to help.

Many boys write to me under the impression that they cannot join the Guild as there are no Meccano Clubs in

Individual Membership.

their district. In such cases, and if they cannot form Clubs themselves, boys should join the Guild as individual members. On filling up the usual form of application they will receive a badge and Certificate, and if on holiday where there is an affiliated Club, they will be able to spend an evening with the Club. The Guild has many thousands of "lone" members in all parts of the world.

It was for the benefit of these "lone" members that the Correspondence Club was originated. If a member has a cheerful cor-

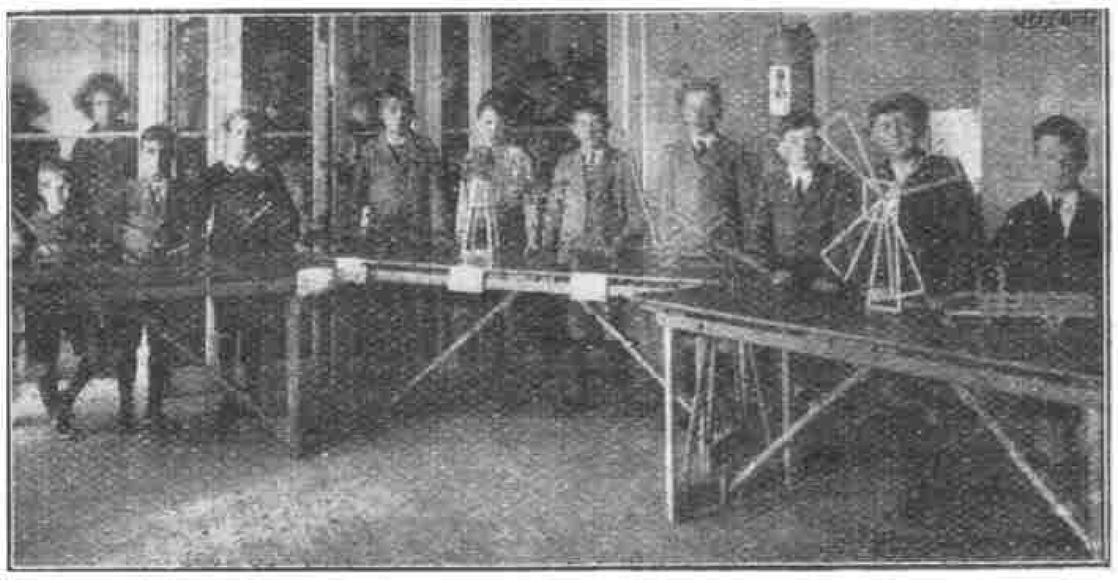
Correspondence Club.

respondent, he is able to sit down and write to him as though he were chatting to him in the Club-room. I am always pleased to find suitable correspondents and it will help me to do so if, when writing to me on the subject, members will mention their age and whether they wish to correspond with a boy living in England or abroad. If correspondence is desired with a boy living in a country where English is not spoken, it should be stated whether correspondence will be carried out in the language of that particular country.

A Successful Meccano Competition.

A successful Gala was held recently at the Church Army Social Centre, Chipping Norton. The Exhibition was well patronised, and reflected great credit on the organisers.

Interesting Competitions were held, including a Meccano Model Building Section. We have pleasure in publishing a photograph of some of the boys who took part.



The room was decorated with Meccano streamers and posters and rivalry was keen. We hope that each of the boys who entered for this Competition will also send in models for the big £250 Competition, particulars of which are announced elsewhere in this issue.

CLUB NOTES

South Kirby M.C.—Making better progress than ever. "Discussion Nights" and "Table Games Night" (Tennis, Cricket and "Who Knows") prove immensely popular. Programme for next Session includes model building and demonstration on "Soldering" by the Club Leader, speed-building test, social evening and an "At Home." *Secretary:* J. Williamson, School House, South Kirby, near Wakefield.

Parkstone Congregational M.C.—Continues to make good progress. A very successful Exhibition was held on 29th November, resulting in an increase in membership. Members working hard on their model for Inter-Club Model Competition. *Secretary:* F. Brumwell, Fernside Avenue, Parkstone.

Rolleston M.C.—Successful Exhibition and Concert held on 13th December, 1922. *Secretary:* Phin Toon, Sherbourne House, Tutbury Road, Rolleston, Burton-on-Trent.

St. Mary-with-St. Gabriel M.C.—Very creditable display of models was given in connection with the Sale of Work held recently. The Club continues to make good progress. *Secretary:* Mr. C. Curle, 37, Pullens Buildings, Peacock Street, London, S.E.

Liscard High School M.C.—During last Session members of this progressive Club paid a visit to the Meccano Factory. Also, by kind courtesy of Captain W. H. Fry, R.N.R., they visited Engineering Works of Wallasey Ferries. Later, one of the blacksmiths from the latter works gave a Lecture to the Club on "Applied Mensuration." A Cinema Show was given by the the kindness of Scoutmaster T. H. Pickles, depicting "Life on the Ranches of Oxo" in addition to other films of interest. Mr. Shinn, a local Electrical Engineer, gave an interesting lecture on "Electric Wiring." It is hoped that Mr. Kenny Campbell, the International Goalkeeper, will give a Lecture to the Club at an early date. The boys are all Football enthusiasts, and Mr. T. Karras has kindly undertaken to coach the teams. *Secretary:* B. Warburton, 11, Brisbane Avenue, New Brighton.

St. Cedas M.C.—A Social, Dance and Exhibition held during the past Session proved immensely popular and included the exhibition of a large number of models *Secretary:* S. F. Elliott, 142, Beckton Road, Canning Town, London, E.16.

Central Secondary School M.C.—Continues to make good all round progress. The Lecture "The Story of Our Ships" met with an enthusiastic reception. An interesting programme is being drawn up for the Second Winter Session. *Secretary:* A. S. Taylor, Fern Lea Villas, 19, Roach Road, Ecclesall, Sheffield.

Sparkbrook M.C.—The energetic members have organised a Football Club and were all very excited when they received their special jerseys. *Secretary:* Francis Hubball, 71, Turner St., Sparkbrook, Birmingham.

Bromsgrove M.C.—The Secretary won First Prize in Mr. Cooke's Meccano Competition and I congratulate him on his success. *Secretary:* L. Edwards, 148, Worcester Street, Bromsgrove.

Clubs Recently Affiliated.

St. Johns (Northallerton) M.C.—At present only eight members, but all are very enthusiastic. Meetings are held three times a week. *Secretary:* Vivian Todd, The Cottage, Appleton Wiske, Northallerton.

Motherwell M.C.—A Meccano Section was organised in connection with a local Engineering Exhibition. A Model Workshop, loaned, from Headquarters, together with a number of other models built by the boys, were on view. *Secretary:* C. Tait, "Walworth," Catherine Street, Motherwell.

Hanson (Bradford) M.C.—Good progress has already been made and the Club membership now stands at 27. An interesting programme is being drawn up for the coming Session. *Secretary:* J. Wm. Whitworth, 107, Curzon Road, Bradford.

Wisbech M.C.—Been in existence for a few weeks only but promises to develop into a really successful Club. *Leader:* Mr. E. A. Ransome, 61, Rammoth Road, New Walsoken, Wisbech.

Kerry M.C.—Club Leader writes: "The splendid Lecture 'The Story of Our Ships' was much appreciated by all members of the Club. The Club is progressing very well. There are now eleven members and we have held some very successful meetings." *Secretary.* S. Bowen, New Inn Hotel, Kerry, Mont.

Southall M.C.—Established under the direction of Mr. E. C. Carpenter, this Club has every prospect of becoming successful. Any Guild member living in Southall should communicate with the *Secretary:* K. Watson, 29, Regina Road, Southall, Middlesex.

Club Not Yet Affiliated.

East Croydon M.C.—This Club invites new members. Any Meccano boys who live in East Croydon should make it their business to join. *Secretary:* Murry F. Wilson, 46, Cedar Road, Easy Croydon, Surrey.

BRIGHT IDEAS

These columns are reserved for dealing with suggestions sent in by Meccano users for new parts, new models and new ways of making Meccano model-building attractive. We are always pleased to hear from any Meccano boy who has an idea which he considers will be useful in the Meccano system.

G. Everitt (Great Yarmouth).—(1) We are considering the question of curved girders. (2) A triple cranked rod on the lines you suggest has only one application. A new part must possess a much wider scope before we could consider its introduction. (3) Would not our healds serve the purpose of your suggested wire stays? (4) We shall keep in mind your suggestion for a passenger brake van.

M. Collin (Aix Les Bains).—The Meccano clockwork motor provides sufficient power for simple models. A loose spring such as you suggest is always a source of danger through accidental release and consequent sudden expansion.

Henry Storer (Wandsworth Common, S.W.).—We illustrate the method of driving models by Clockwork and Electric Motors in our Manual. This principle applies to any model suitable for driving by mechanical power.

M. Noel A. Chatenois.—We have in mind the piercing of the sector plates with holes along the edges.

M. Davoust (Fouquenies Par Beauvais).—The bearing you suggest is for use where there is heavy friction. The method we adopt in such cases is to re-inforce a strip bearing with two or three additional strips.

J. Aberdun (Colchester).—The single hand-rail support was introduced for use with a model loco and other similar models. Double or treble hand-rail supports for other construction may be made from couplings and rods.

D. Reeves (Byfleet).—(1) We do not think that a $12\frac{1}{2}'' \times \frac{1}{2}''$ double angle strip has any great advantages. (2) The application of the spanner to the nut whilst screwing up the bolt will ensure a firm connection. Extra rigidity may be obtained by using a 1" angle bracket.

A. W. Hammonds (Totterdown, Bristol).—(1) We shall keep in mind your suggestion for miniature barrels. (2) We already list a $5\frac{1}{2}'' \times 3\frac{1}{2}''$ flat plate. Do you consider your suggested $5\frac{1}{2}'' \times 5\frac{1}{2}''$ plate to have any advantages over our present one?

M. C. Guillaume (Nantes).—Up to the present we have not seen a satisfactory working model of a cinematograph. The apparatus would require so many foreign pieces that we have never seriously thought of incorporating it as a working model.

Richard K. Dresden (Streatham, S.W.).—(1) We shall consider the question of larger bevel wheels. (2) We list separate discs for attachment to face plates for making larger flanged wheels.

M. Federspiel (Metz).—We are at the moment considering the question of helical gears. These would be more adaptable than a combination of gear wheel and wide pitch worm wheel, as the drive could be applied to either shaft.

W. E. Maw (Leicester).—Our type of electric movement is too large to be accommodated in the No. 1 Engine. A smaller movement is not possible without sacrificing efficiency.

Jack Day (Heywood, Lancs.).—(1) Toothed wheels of even measurement would not mesh with our present $\frac{1}{2}''$ standard wheels. We have under consideration the introduction of a $3\frac{1}{2}''$ gear wheel. (2) Thanks for the suggested link motion. We shall have to go carefully into its possibilities and application. (3) The "*M.M.*" is being published monthly from September until the end of the year.

S. Sharp (Bowes Park, N.).—(1) No doubt we shall eventually introduce the three track switch, but not just yet. (2) You should send for our rail formations leaflet, for the two point combination is there illustrated, together with many other figures that will be of interest to you. It costs 4d., post free.

M. Lucien D'auzet (Villeneuve).—We think our regular spring connected diagonally to two strips disposed at a right angle would overcome your difficulty.

V. Lintott (Beccles, Suffolk).—We shall see whether your suggested $5\frac{1}{2}''$ face plate has any scope but we are inclined to doubt its possessing any advantages over the present 3" face plate.

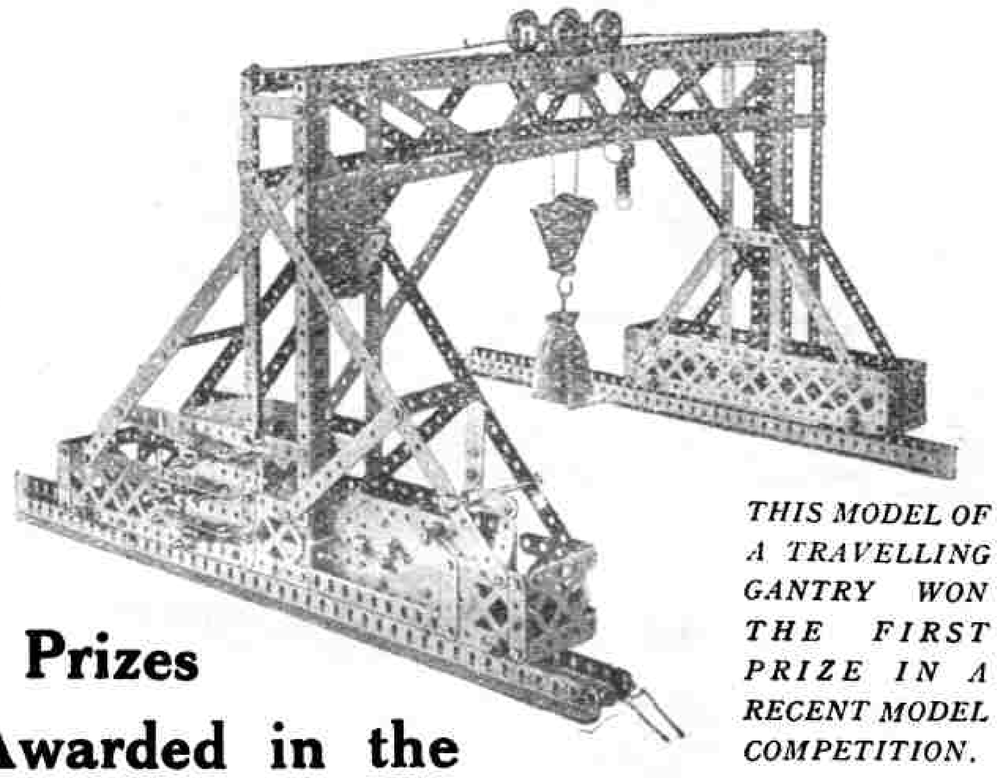
Roy Cureton (Ainsdale).—You cannot be a very enthusiastic Meccano boy, Roy, or you would know that we list such indispensable articles as washers. Apply to your dealer for our latest list, in which you will probably find many other interesting things.

Y. Gaynard (Paris).—We do not quite understand the purpose of your suggestion for an articulated coupling. Perhaps you will send us some further particulars.

Norman Keith (Geelong, Victoria, Australia).—Tie your cord with a figure 8 knot, which makes a much smaller knot than a double half-hitch.

Cyril Jaque (London, E.).—The question of the slide action along the rod at the same time giving a positive drive has already been raised, but it is impracticable on account of the smallness of the diameter of our rods.

Enter this Splendid Competition



THIS MODEL OF A TRAVELLING GANTRY WON THE FIRST PRIZE IN A RECENT MODEL COMPETITION.

£250 in Prizes

Awarded in the

Meccano Model-Building Competition

Cash prizes to the value of £100, Meccano Outfits, Inventors' Accessory Outfits, Hornby Trains and Zulu Trains to the value of £150.

These prizes will be awarded in the next Meccano-building Competition, for which every Meccano boy should enter. As was the case last year, the Competition will be divided into three sections (1) for boys under 10 years of age, (2) for boys between 10 and 14 years of age and (3) for boys over 14 years of age.

There are no restrictions and no entrance fees. Full particulars and entry form will be sent on application. The closing date for the Competition will be 15th April, 1923, for entries from the United Kingdom, and the 30th May, 1923, for entries from Overseas.

Ask your dealer, or send to us, for an Entry Form.

G. Blakely (Ontario, Canada).—We have in mind the question of flat angle and "T" pieces. We must first of all explore their application and determine the best sizes.

S. Irlam (Salford).—(1) The couplings on the Hornby Trains were purposely designed to protrude beyond the buffers, otherwise the buffers would foul each other on the narrow radius rails and so derail the train. (2) We have the question of curved girder sections under consideration.

W. Penfold (Peckham, S.E.).—We should be glad to hear of any uses you have found for the suggested curved rack strip.

Jack Glendinning (Thirsk).—We are engaged on a suitable sliding gear. The trouble with flat rods is the uneven action in the bearings.

John Morton (Belfast).—Any gradient over $1\frac{1}{2}''$ in 12" is scarcely practical with clockwork engines. Their light weight would be insufficient to ensure a grip on the rails. The present straight rails can be adapted to the above mentioned gradient.

E. Holbrook (West Croydon).—We are afraid we do not understand your statement that the flanged disc combined with the face plate does not make an efficient flanged wheel. This combination gives a flange of nearly 3/16" which is more than adequate to keep your engine on its rails.

Gilly Kowitz (Oakey, Cooyer Line, Queensland).—It has already been suggested that we should pierce a hole in the centre latticing of the braced girder. If there are any advantages in it, we shall certainly do it.

H. C. Key (Calcutta, India).—Double angle strips lend themselves admirably to steps.

Robert Poeros a Cournon (Puyde Dome).—We are considering a rack element which may be used for operating a tractor, and this will be announced when ready.

Leslie Jones (Bristol).—Perhaps at some later date we may introduce the crane bucket as an accessory.

Jack Lord (Haslingden).—Thanks for your suggested connection from crank-shaft to slay on model looms. We are afraid that it is rather too elaborate, and in any case the number of parts that are not interchangeable would tend to preclude its introduction from the Meccano System. (2) We shall go carefully into the matter of the ratchet although our present pawl used in conjunction with the pinion wheels makes a good ratchet.

M. Guilmarol (Angers).—Existing parts are adaptable to making the road spring you suggest. See, for instance, the method of front shackle connection on the Meccano Chassis.

Mm. H. and G. Vermeulen (Etterbeek-Bruxelles).—(1) The shank of the threaded pin is the same diameter as the standard rod and should permit of its insertion through the boss of any wheel. (2) We are afraid we do not see any special uses for a threaded boss in two parts and it would be very much more expensive to make than our present type.

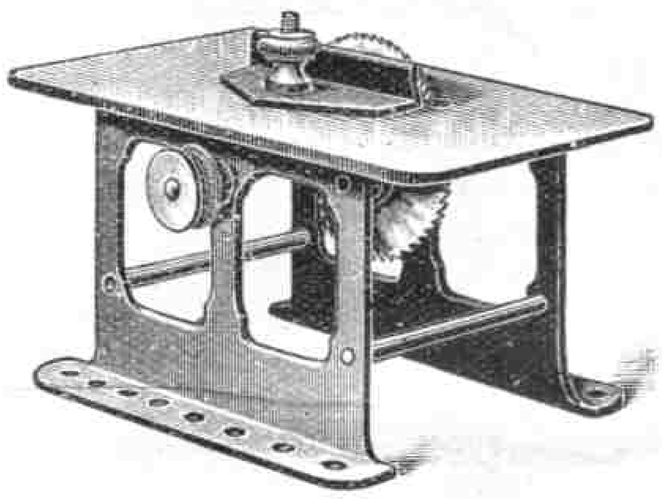
A. F. Butters (Saltburn-by-Sea).—A double throw crank may be made by joining two cranks together by means of a coupling.

Mr. G. A. Liardet (Bradford).—Your suggestion for a grooved rod to prevent wheels from slipping would not be practical with our present rods, on account of the smallness of the diameter.

J. Henniker (Ashford, Kent).—The pipes above the couplings of trains are flexible tube couplings for the vacuum brakes. This item added to Hornby Trains would merely be ornamental and would serve no useful purpose.

Jack Royds (Caversham).—We have the subject of circular plates under consideration, also curved angle girders. The two together would give flanged plates.

Model Saw-benches



We have a number of model saw-benches suitable for use with electric motors or vertical steam-engines. Our stock is limited and readers are advised to take advantage of this offer immediately as the stock will be quickly exhausted.

Model saw benches as illustrated, each 4/- (postage 7d.).

New Meccano Part

34B. Box Spanners ... ... each 3d.

A Useful Tool

Our illustration shows a type of screwdriver useful for reaching bolts in inaccessible places on models. For this reason the blade has been made so that it may be passed through the standard Meccano hole to reach bolts so placed. We are disposing of these screwdrivers whilst our stock lasts, at the special price of 10d. each, post free.

The Meccano Leaflets

Those Meccano boys who have not had copies of the Meccano leaflets should order them immediately. There are now three leaflets published: (1) Chassis Leaflet, giving full instructions for building the Special Meccano model of a motor chassis; (2) Loom Leaflet, giving full particulars of the Meccano Loom for real weaving; (3) Charging Board Leaflet, instructions for making a Charging Board, to enable the Meccano electric motor to be run direct from the electric light main and to charge accumulators from the same source.

These leaflets are sent post free at the following prices:—

Motor Chassis Leaflet	4d.
Loom Leaflet	4d.
Charging Board Leaflet	3d.

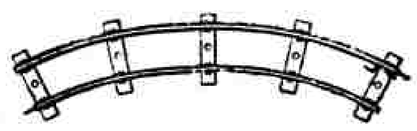
MECCANO RAILS

POINTS AND CROSSINGS.

MECCANO Rails, Points and Crossings are built for hard wear and smooth running. They are made of the finest materials and hold together rigidly and strongly, for real workmanship is put into them. Note the great superiority both in quality and appearance of the Meccano Rails as compared with the usual continental-made Rails. Note also the extra sleepers, giving an added steadiness to the track. Each sleeper is stamped with the name "MECCANO" and you should look for this in order to ensure getting the genuine article.

NOTE.—All Rails, Points and Crossings illustrated below may be obtained with a centre rail for use with Electric Trains. Send for descriptive leaflet.

Rails for Clockwork and Steam Trains, Guage 0, 1⅜-in., Alternate Pegs.



For 1-ft. 6-in. diameter circle.

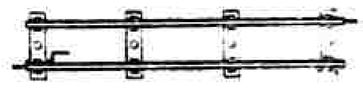
A9.	Curved Rails (9-in. radius) for 1-ft. 6-in. diam. circle ... ... per doz. ...	3/-

For 2-ft. diameter circle.

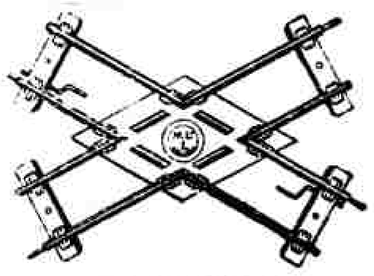
A1.	Curved Rails (1-ft. radius) per doz. ...	4/-
A1½.	Curved Half Rails ... ... ,, ...	3/-
A1¼.	Curved Quarter Rails ... ,, ...	2/6

For 4-ft. diameter circle.

A2.	Curved Rails (2-ft. radius) per doz. ...	5/-
A2½.	Curved Half Rails ... ... ,, ...	3/6
A2¼.	Curved Quarter Rails ... ,, ...	3/-

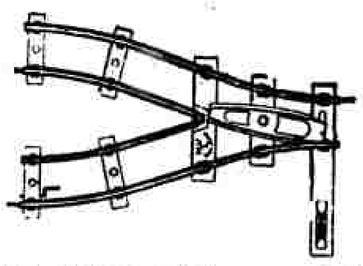


B1.	Straight Rails ... ... per doz. ...	3/-
B½.	Straight Half Rails ... ... ,, ...	2/6
B¼.	Straight Quarter Rails ... ,, ...	2/-

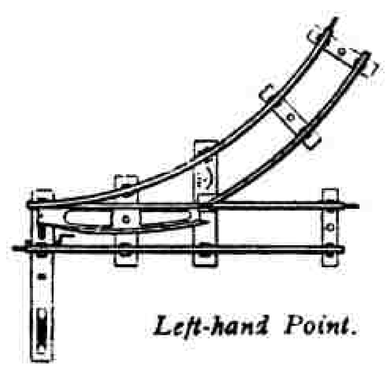


CROSSINGS.

CA.	Acute-angle Crossings ... each ...	1/6
CR.	Right-angle Crossings ... ,, ...	1/6



PPR.	Parallel Points, right ... each ...	3/-
PPL.	Parallel Points, left ... ... ,, ...	3/-



Left-hand Point.

POINTS.

For 1-ft. 6-in. diameter circle.

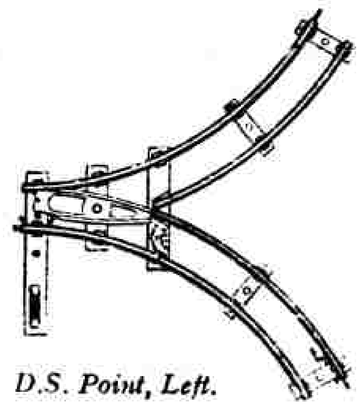
PR9.	Right-hand Point (9-in radius)	each 2/6
PL9.	Left-hand Point (9-in. radius)	,, 2/6

For 2-ft. diameter circle.

PR1.	Right-hand Point (1-ft. radius)	each 2/6
PL1.	Left-hand Point (1-ft. radius)	,, 2/6

For 4-ft. diameter circle.

PR2.	Right-hand Point (2-ft. radius)	each 2/6
PL2.	Left-hand Point (2-ft. radius)	,, 2/6



D.S. Point, Left.

DOUBLE SYMMETRICAL POINTS.

For 2-ft. diameter circle.

DSR1.	Double Symmetrical Points (1-ft. radius), right ... ... each ...	3/-
DSL1.	Double Symmetrical Points (1-ft. radius), left ... ... ,, ...	3/-

For 4-ft. diameter circle.

DSR2.	Double Symmetrical Points (2-ft. radius), right ... ... each ...	3/-
DSL2.	Double Symmetrical Points (2-ft. radius), left ... ... ,, ...	3/-

Which are the Six Best Books for Boys?

Which are the six best books for boys is a difficult question to answer, for everything depends upon the taste of the individual reader.

We are anxious to find out just exactly what type of books readers of the "*M.M.*" prefer—whether they prefer fiction to any other class and if so what type of fiction: school stories, adventure, historical novels, detective tales, etc. For this purpose we announce a Competition in which entrants should send a list of what they consider are the six best books for boys.

The books should be arranged in order of merit and the first prize, a No. 1 Hornby Train Set, will be awarded to the reader who places the six books in the order nearest to that order of merit voted for by all readers participating in the competition.

The voting must be on post cards only and they should reach the Editor of the "*M.M.*" before the 31st January next. Mark your post cards "Best Book Competition."

IMPORTANT NOTICE.

We are constantly asked to supply back numbers of the "*M.M.*" Our readers will please note that we print only sufficient copies to fill the regular orders on our books, and back numbers cannot therefore be supplied. In order to prevent disappointment our readers are advised to place a regular order either with a Meccano dealer or direct with us.

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, and only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

S. Leach (Newtown).—We are pleased to hear you think the "*M.M.*" is "a top-hole paper and that it gets better every issue." Your pleasure at its monthly publication is shared by tens of thousand of other readers. We are sorry that on your recent visit to Liverpool you were not able to get up to see us, and note that the closest touch you were able to have was to see a tramcar making its way to "Old Swan!" We hope you will have better luck next time.

R. C. Clarke (Woking).—The lecture on Liquid Oxygen must indeed have been interesting. To see a kettle boil on a block of ice, rubber balls frozen so that they could be cracked like nuts, and tomatoes and meat frozen until they could not be broken with a hammer, was indeed a unique experience. We feel sure that every reader of the "*M.M.*" wishes he could have been with you.

I. P. Fraser (Elgin).—Thank you for your congratulations on the recent improvements in the "*M.M.*" We heartily reciprocate your wishes, Ian, and wish you a very happy New Year.

James Adams (Motherwell).—You are quite right, James, when you say "there seems to be no limit to the possibilities of the Super-Toy, Meccano." We are pleased to hear that you enjoyed the Meccano lecture and that your Club is making such good progress.

T. F. Tonnessen (Bergen, Norway).—You certainly are an enthusiastic supporter of the "*M.M.*" and we have pleasure in entering your subscription, which will not now expire until you receive a copy of No. 64!

H. C. Key (Calcutta, India).—I regret that at present space does not permit of a jokes and riddles column in the "*M.M.*"

V. C. Davey (Ipswich).—We feel sure that all other readers of the "*M.M.*" share your wish to see a photograph of the inventor of Meccano. We must use our best endeavours to persuade Mr. Hornby to be photographed with this end in view.

H. W. Bird (Ulverston).—Thank you for your Riddle-me-ree, but we are afraid that it would present no difficulty to the bright readers of the "*M.M.*" You must try again and give them something more difficult.

R. A. Baldwin (London, S.E.5).—Your rhyme is very good considering your age, but it is scarcely up to our standard. We are pleased you enjoy reading the "*M.M.*"

G. Cowe (Midlothian).—"Latin is dry, the very name is enough, but Science is the opposite. Of course you know all about it."—We do indeed, George, but Latin will perhaps be of more use to you than you can at present understand, and we advise you to persevere and work hard at it.

L. Baxter (Birmingham).—I was particularly glad to know that Meccano has been the means of finding your best chums. A good hobby has often served as a wonderful bond of friendship and I hope you will continue to derive pleasure and instruction from Meccano for many years to come.

W. E. Pickard (Prestwich).—We do not think a rubber stamp for marking note paper would be quite suitable. We have in mind the issuing of special note paper of nice quality and well printed, for the use of Meccano boys only and before long we may be able to announce shortly that this is available.

A. Burnett (Camden Town, N.W.).—Sorry to disappoint you, but at present space in the "*M.M.*" does not permit of the inclusion of "Jokes" columns.

E. Jackson (Dublin).—Thanks for the photo of the rolling lift-bridge at Dublin. If space permits in the near future I shall publish this as an item of engineering interest.

Y. H. Eckert (London, N.2).—I am pleased to hear that you are so delighted with the enlarged Magazine.

T. A. Gatley (Peel Green).—"I hope you enjoyed your visit to America. I will come with you next time you go, if you have no objection."—Not the slightest objection, T. A., but we fear your parents might object to the cost of the trip. It would be a pleasure to take a boat-load of Meccano boys with us each time.

F. L. James (Cardiff).—We deeply sympathise with you. You must have suffered greatly, but no doubt the amputation of your leg secured you from something more serious. Many thanks for the old "Mechanics Made Easy" adverts, which bring back pleasant memories. We hope you will write to us often.

C. Cliff (Stone).—We are hoping to start a Stamp Collectors' Column, as well as other new features, in the near future. You are very fortunate in having so many splendid toys and we hope you will derive much pleasure from your Meccano Electric Motor.

V. Atkinson (Liverpool).—Thank you for your rhyme, but although perfectly truthful, it is not up to our usual standard.

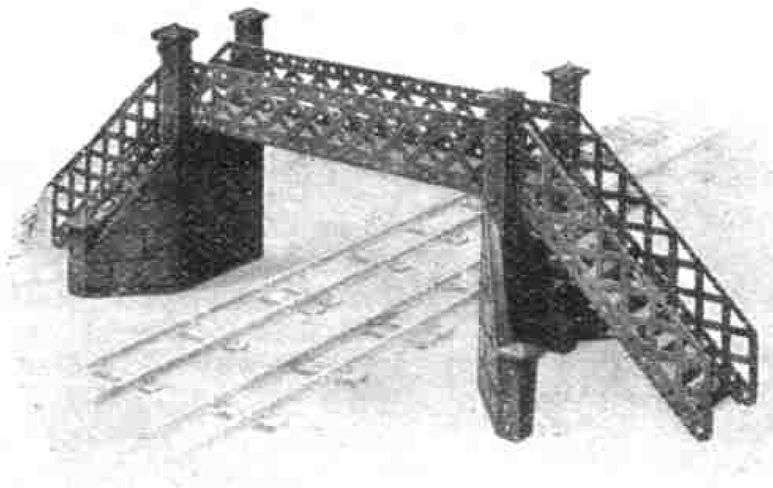
J. Mercieca (Malta).—Congratulations, Joseph, on your having won the third prize in the £12 Meccano Competition, held by our Malta Agents. Your entries for the various "*M.M.*" Competitions have been received and will be dealt with in due course. We heartily reciprocate your good wishes for the New Year.

T. Angear (Torpoint, Cornwall).—"My Meccano badge seems to bring me good luck every day.."—We trust your good luck will continue and note you have been requested to give lessons in Meccano at your school. You will find full particulars of models that may be constructed with a No. 5 Outfit in the Meccano Manual.

TRAIN ACCESSORIES

GAUGE O

THE addition of Train Accessories further enhances the fun to be obtained from a Clockwork Train. Every boy possessing a set should provide himself with the complete series of accessories illustrated below. Each unit is strongly built of the finest material and the greatest care is taken in its manufacture, to ensure that the high standard of Meccano Products is maintained.



LATTICE GIRDER BRIDGES

AS will be seen from our illustration these Bridges are of the constructional type, strong and well-proportioned. The design of the well-known Meccano braced girder has been followed in footways and steps, giving realistic and pleasing appearance. The Bridges are beautifully enamelled in colours.

The Meccano system of equi-distant holes has been preserved so that signals made from Meccano strips, etc., may be erected on the Bridges.

Lattice Girder Bridges are supplied disassembled for convenience of packing.

Price ... ... each 10/6

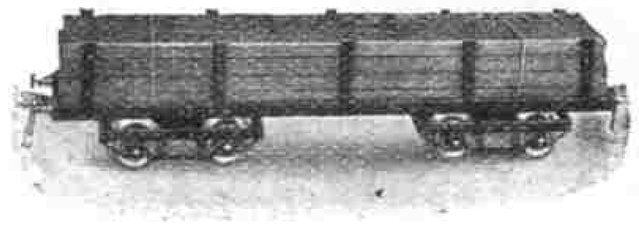
TIMBER WAGONS No. 1

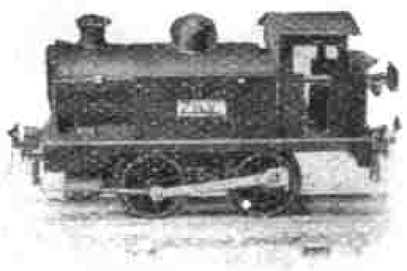
Suitable for all rails. Complete with load of timber ... ... each 2/-

TIMBER WAGONS No. 2

These timber wagons measure 13 inches in length and are beautifully enamelled in colours.

Suitable only for rails of 2-ft. radius (forming circles 4 ft. in diameter). Complete with load of timber ... ... each 5/6

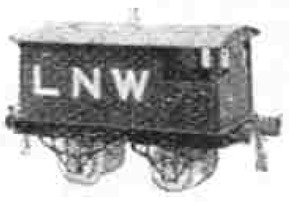




ZULU TANK LOCOS

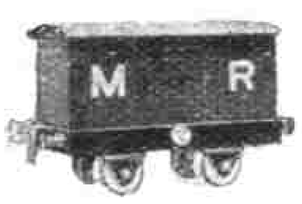
Strong and durable Locos capable of any amount of hard work; richly enamelled and highly finished; fitted with brake, governor, and reversing gear.

In black only ... ... each 12/6



BRAKE VANS

Finished in colour to represent L. & N. W. system each 4/-

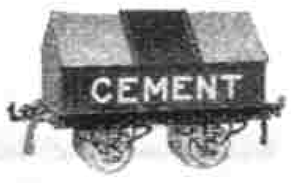


COVERED LUGGAGE VANS

Lettered M. R. ... each 4/6

PETROL TANK WAGONS

Finished in red, lettered gold each 3/6

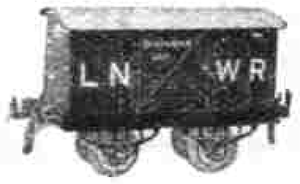


CEMENT WAGONS

Enamelled in colour each 4/6

SPRING BUFFER STOPS

Enamelled in colour each 2/-



GUNPOWDER VANS

Finished red ... each 4/-

ADVERTISEMENTS

In response to numerous requests, it has been decided to accept small miscellaneous advertisements in the "*M.M.*," commencing with the March issue. The rates are 1/- per line (average 7 words to the line) or 10/- per inch (average 12 lines to the inch). Further particulars will be sent on request. Address your letter to ADVERTISEMENT MANAGER, *Meccano Magazine*, Binns Road, LIVERPOOL.

PUBLISHED BY MECCANO LTD., BINNS ROAD, LIVERPOOL.
Printed by The P.P. Press, King Edward Street, Liverpool.